

WHAT IS CLAIMED IS:

1. A base station of a mobile communication system which adopts a transmission power control system, comprising:
 - a communication monitor circuit for detecting quality deterioration of radio communication with mobile stations, wherein:
 - said communication monitor circuit comprising:
 - a monitor unit for monitoring a communication state of said radio communication,
 - a judging unit connected to said monitor unit for judging whether said communication state monitored by said monitor unit is worse than a predetermined state, and
 - a notifying unit connected to said judging unit for notifying an external circuit of said quality deterioration when said judging unit judges that said communication state is worse than said predetermined state.
2. A base station as claimed in Claim 1, said base station further comprising receivers for demodulating transmission signals transmitted from said mobile stations to produce demodulated signals, wherein:
 - said monitor unit is connected to said receivers for monitoring total interference electric power of said demodulated signals as said communication state, and
 - said judging unit judging that said communication state is worse than said predetermined state when said total interference electric power is equal to or larger than a predetermined threshold.
3. A base station as claimed in Claim 1, said base station further comprising receivers for demodulating transmission signals transmitted from said mobile stations to produce demodulated signals

and signal-to-noise ratio determining circuits connected to said receivers respectively for determining signal-to-noise ratios of said demodulated signals, wherein:

said monitor unit is connected to said signal-to-noise ratio determining circuits for periodically finding an average of said signal-to-noise ratios as said communication state,

said judging unit judging that said communication state is worse than said predetermined state when the number of signal-to-noise ratios each of which is larger than the average is equal to or larger than a predetermined threshold.

4. A base station as claimed in Claim 1, said base station further comprising receivers for demodulating transmission signals transmitted from said mobile stations to produce demodulated signals, signal-to-noise ratio determining circuits connected to said receivers respectively for determining signal-to-noise ratios of said demodulated signals and transmission power control bit generators connected to said signal-to-noise ratio determining circuits respectively for generating transmission power control bit signals on the basis of said signal-to-noise ratios, wherein:

said monitor unit is connected to said transmission power control bit generators for monitoring said transmission power control bit signals as said communication state,

said judging unit judging that said communication state is worse than said predetermine state when the number of said transmission power control bit signals each of which require increase of transmission power is equal to or larger than a predetermined threshold.

5. A base station as claimed in Claim 1, said base station further comprising receivers for demodulating transmission signals

transmitted from said mobile stations to produce demodulated signals, wherein:

said monitor unit is connected to said receivers for monitoring total interference electric power of said demodulated signals and the number of said mobile terminals communicating with said base station as said communication state,

said judging unit judging that said communication state is worse than said predetermined state when a changing rate of a ratio of said total interference electric power to the number of said mobile terminals communicating with said base station is equal to or larger than a predetermined threshold.

6. A base station of a mobile communication system which adopts a transmission power control system to control transmission power of mobile stations by use of transmission power control bit signals, said base station including receivers for demodulating transmission signals transmitted from said mobile stations to produce demodulated signals, signal-to-noise ratio determining circuits connected to said receivers respectively for determining signal-to-noise ratios of said demodulated signals and transmission power control bit generators connected to said signal-to-noise ratio determining circuits respectively for generating said transmission power control bit signals on the basis of said signal-to-noise ratios, said base station comprising:

a communication state monitor circuit connected to said receivers for detecting quality deterioration of a communication state of radio communication between said base station and said mobile stations, and

a transmission power bit adjusting circuit connected to said quality deterioration detector and said transmission power control bit generators for controlling said transmission power control bit signals so

as to suppress increase of transmission power of said mobile stations when said quality deterioration detector detects said quality deterioration.

7. A base station as claimed in Claim 6, said transmission power control bit generators generating the transmission power control bit signals which requires increase of transmission power of said mobile stations when signal-to-noise ratios are equal to or lower than a desired value, wherein:

said transmission power control bit adjusting unit decreases said desired value to suppress increase of transmission power of said mobile stations when said quality deterioration detector detects said quality deterioration.

8. A base station as claimed in Claim 6, wherein:

said transmission power control bit adjusting unit changes said transmission power control bit signals so that said transmission power control bit signals require decrease of said transmission power of said mobile stations.

9. A base station as claimed in Claim 6, said communication state monitor circuit comprises:

a monitor unit for monitoring said communication state of said radio communication,

a judging unit connected to said monitor unit for judging whether said communication state monitored by said monitor unit is worse than a predetermined state, and

a notifying unit connected to said judging unit for notifying said transmission power control bit adjusting unit of said quality deterioration when said judging unit judges that said communication state is worse than said predetermined state.

10. A base station as claimed in Claim 9, wherein:

said monitor unit is connected to said receivers for monitoring total interference electric power of said demodulated signals as said communication state, and

said judging unit judging that said communication state is worse than said predetermined state when said total interference electric power is larger than a predetermined threshold.

11. A base station as claimed in Claim 9, wherein:

said monitor is connected to said signal-to-noise ratio determining circuits instead of said receivers for periodically finding an average of said signal-to-noise ratios as said communication state,

said judging unit judging that said communication state is worse than said predetermined state when the number of signal-to-noise ratios each of which is larger than the average is equal to or larger than a predetermined threshold.

12. A base station as claimed in Claim 9, wherein:

said monitor unit is connected to said transmission power control bit generators instead of said receivers for monitoring said transmission power control bit signals as said communication state,

said judging unit judging that said communication state is worse than said predetermine state when the number of said transmission power control bit signals each of which require increase of transmission power is equal to or larger than a predetermined threshold.

13. A base station as claimed in Claim 9, wherein:

said monitor unit is connected to said receivers for monitoring total interference electric power of said demodulated signals and the number of said mobile terminals communicating with said base station as said communication state,

said judging unit judging that said communication state is worse than said predetermined state when a changing rate of a ratio of said total interference electric power to the number of said mobile terminals communicating with said base station is equal to larger than a predetermined threshold.

14. A transmission power control system for use in a base station of a mobile communication system to control transmission power of mobile stations by use of transmission power control bit signals, said base station including receivers for demodulating transmission signals transmitted from said mobile stations to produce demodulated signals, signal-to-noise ratio determining circuits connected to said receivers respectively for determining signal-to-noise ratios of said demodulated signals and transmission power control bit generators connected to said signal-to-noise ratio determining circuits respectively for generating said transmission power control bit signals on the basis of said signal-to-noise ratios, said transmission power control system comprising:

a communication state monitor circuit connected to said receivers for detecting quality deterioration of a communication state of radio communication between said base station and said mobile stations, and

a transmission power bit adjusting circuit connected to said quality deterioration detector and said transmission power control bit generators for controlling said transmission power control bit signals so as to suppress increase of transmission power of said mobile stations when said quality deterioration detector detects said quality deterioration.

15. A transmission power control system as claimed in Claim 14, said transmission power control bit generators generating said transmission power control bit signals which require increase of

transmission power of said mobile stations when said signal-to-noise ratios are equal to or lower than a desired value, wherein:

said transmission power control bit adjusting unit decreases said desired value to suppress increase of transmission power of said mobile stations when said quality deterioration detector detects said quality deterioration.

16. A transmission power control system as claimed in Claim 14, wherein:

said transmission power control bit adjusting unit changes said transmission power control bit signals so that said transmission power control bit signals require decrease of said transmission power of said mobile stations.

17. A transmission power control system as claimed in Claim 14, said communication state monitor circuit comprises:

a monitor unit for monitoring said communication state of said radio communication,

a judging unit connected to said monitor unit for judging whether said communication state monitored by said monitor unit is worse than a predetermined state, and

a notifying unit connected to said judging unit for notifying said transmission power control bit adjusting unit of said quality deterioration when said judging unit judges that said communication state is worse than said predetermined state.

18. A transmission power control system as claimed in Claim 17, wherein:

said monitor unit is connected to said receivers for monitoring total interference electric power of said demodulated signals as said communication state, and

said judging unit judging that said communication state is worse than said predetermined state when said total interference electric power is equal to or larger than a predetermined threshold.

19. A transmission power control system as claimed in Claim 17, wherein:

said monitor is connected to said signal-to-noise ratio determining circuits instead of said receivers for periodically finding an average of said signal-to-noise ratios as said communication state,

said judging unit judging that said communication state is worse than said predetermined state when the number of signal-to-noise ratios each of which is larger than the average is equal to or larger than a predetermined threshold.

20. A transmission power control system as claimed in Claim 17, wherein:

said monitor unit is connected to said transmission power control bit generators instead of said receivers for monitoring said transmission power control bit signals as said communication state,

said judging unit judging that said communication state is worse than said predetermine state when the number of said transmission power control bit signals each of which require increase of transmission power is equal to or larger than a predetermined threshold.

21. A transmission power control system as claimed in Claim 17, wherein:

said monitor unit is connected to said receivers for monitoring total interference electric power of said demodulated signals and the number of said mobile terminals communicating with said base station as said communication state,

said judging unit judging that said communication state is worse than said predetermined state when a changing rate of a ratio of said total interference electric power to the number of said mobile terminals communicating with said base station is equal to larger than a predetermined threshold.

22. A method of controlling transmission power of mobile stations from a base station of a mobile communication system, comprising the steps of:

monitoring, with a monitor unit located in said base station, a communication state of said radio communication,

judging, with a judging unit connected to said monitor unit in said base station, whether said communication state monitored at the monitoring step is worse than a predetermined state, and

notifying, from a notifying unit connected to said judging unit in said base station, an external circuit of said quality deterioration when judgement that said communication state is worse than said predetermined state is made at the judging step.

23. A method as claimed in Claim 22, said base station having receivers for demodulating transmission signals transmitted from said mobile stations to produce demodulated signals, said monitor unit connected to said receivers, wherein:

the monitoring step is for monitoring total interference electric power of said demodulated signals as said communication state,

the judging step being for judging that said communication state is worse than said predetermined state when said total interference electric power is equal to or larger than a predetermined threshold.

24. A method as claimed in Claim 22, said base station having receivers for demodulating transmission signals transmitted from said

mobile stations to produce demodulated signals and signal-to-noise ratio determining circuits connected to said receivers respectively for determining signal-to-noise ratios of said demodulated signals, said monitor connected to said signal-to-noise ratio determining circuits, wherein:

the monitoring step is for periodically finding an average of said signal-to-noise ratios as said communication state,

the judging step being for judging that said communication state is worse than said predetermined state when the number of signal-to-noise ratios each of which is larger than the average is equal to larger than a predetermined threshold.

25. A method as claimed in Claim 22, said base station having receivers for demodulating transmission signals transmitted from said mobile stations to produce demodulated signals, signal-to-noise ratio determining circuits connected to said receivers respectively for determining signal-to-noise ratios of said demodulated signals and transmission power control bit generators connected to said signal-to-noise ratio determining circuits respectively for generating transmission power control bit signals on the basis of said signal-to-noise ratios, said monitor unit connected to said transmission power control bit generators, wherein:

the monitoring step is for monitoring said transmission power control bit signals as said communication state,

said judging unit being for judging that said communication state is worse than said predetermine state when the number of said transmission power control bit signals each of which require increase of transmission power is equal to or larger than a predetermined threshold.

26. A method as claimed in Claim 22, said base station having receivers for demodulating transmission signals transmitted from said mobile stations to produce demodulated signals, said monitor unit connected to said receivers, wherein:

the monitoring step is for monitoring total interference electric power of said demodulated signals and the number of said mobile terminals communicating with said base station as said communication state,

the judging step being for judging that said communication state is worse than said predetermined state when a changing rate of a ratio of said total interference electric power to the number of said mobile terminals communicating with said base station is equal to or larger than a predetermined threshold.

27. A method of controlling transmission power of mobile stations of a mobile communication system by use of transmission power control bit signals transmitted from a base station, said base station including receivers for demodulating transmission signals transmitted from said mobile stations to produce demodulated signals, signal-to-noise ratio determining circuits connected to said receivers respectively for determining signal-to-noise ratios of said demodulated signals and transmission power control bit generators connected to said signal-to-noise ratio determining circuits respectively for generating said transmission power control bit signals on the basis of said signal-to-noise ratios, comprising the steps of:

detecting, with a communication state monitor circuit, quality deterioration of a communication state of radio communication between said base station and said mobile stations, and

controlling, with a transmission power control bit adjusting circuit connected to said communication state monitor circuit and said transmission power control bit generators, said transmission power control bit signals so as to suppress increase of transmission power of said mobile stations when said quality deterioration is detected at the detecting step.

28. A method as claimed in Claim 27, said transmission power control bit generators generating said transmission power control bit signals which require increase of transmission power of said mobile stations when said signal-to-noise ratios are lower than a desired value, wherein:

the controlling step is for decreasing said desired value to suppress increase of transmission power of said mobile stations when said quality deterioration is detected at the detecting step.

29. A method as claimed in Claim 27, wherein:

the controlling step is for changing said transmission power control bit signals so that said transmission power control bit signals require decrease of said transmission power of said mobile stations.

30. A method as claimed in Claim 27, wherein the detecting step comprises the steps of:

monitoring, with a monitor unit, said communication state of said radio communication,

judging, with a judging unit connected to said monitor unit, whether said communication state monitored at the monitoring step is worse than a predetermined state, and

notifying, from a notifying unit connected to said judging unit, said transmission power control bit adjusting unit of said quality deterioration when judgement that said communication state is worse than said

predetermined state is made at the judging step.

31. A method as claimed in Claim 27, said monitor unit connected to said receivers, wherein:

the monitoring step is for monitoring total interference electric power of said demodulated signals as said communication state,

the judging step being for judging that said communication state is worse than said predetermined state when said total interference electric power is equal to or larger than a predetermined threshold.

32. A method as claimed in Claim 27, said monitor unit connected to said signal-to-noise ratio determining circuits, wherein:

the monitoring step is for periodically finding an average of said signal-to-noise ratios as said communication state,

the judging step being for judging that said communication state is worse than said predetermined state when the number of signal-to-noise ratios each of which is larger than the average is equal to or larger than a predetermined threshold.

33. A method as claimed in Claim 27, said monitor unit connected to said transmission power control bit generators, wherein:

the monitoring step is for monitoring said transmission power control bit signals as said communication state,

the judging step being for judging that said communication state is worse than said predetermine state when the number of said transmission power control bit signals each of which require increase of transmission power is equal to larger than a predetermined threshold.

34. A method as claimed in Claim 27, said monitor unit is connected to said receivers, wherein:

the monitoring step if for monitoring total interference electric power of said demodulated signals and the number of said mobile

the judging step being for judging that said communication state is worse than said predetermined state when a changing rate of a ratio of said total interference electric power to the number of said mobile terminals communicating with said base station is equal to or larger than a predetermined threshold.